

Appln. No. 10/724,242
Amendment dated February 2, 2005
Reply to Office Action of August 3, 2004

REMARKS/ARGUMENTS

Reconsideration of the present application, as amended, is respectfully requested.

The August 3, 2004 Office Action and the Examiner's comments have been carefully considered. In response, claims are cancelled, the title and claims are amended, and remarks are set forth below in a sincere effort to place the present application in form for allowance. The amendments are supported by the application as originally filed. Therefore, no new matter is added.

TITLE OF THE INVENTION

In the Office Action the title of the invention is objected to as not being descriptive. In response, the title of the invention is amended to be more clearly indicative of the invention to which the claims are directed. In view of the amendment of the title, reconsideration and withdrawal of the objection to the title are respectfully requested.

If, even in view of the amendment of the title, the Examiner maintains his objection, the Examiner is respectfully requested to propose a new title in the next Patent Office communication for Applicants' consideration.

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REJECTION UNDER 35 USC 112, SECOND PARAGRAPH

In the Office Action claims 1-7 are rejected under the second paragraph of 35 USC 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In response, claims 1, 5 and 7 are amended in a sincere effort to overcome the indefiniteness rejection.

In view of the amendment of the claims, reconsideration and withdrawal of the rejection of claims 1-7 under the second paragraph of 35 USC 112 are respectfully requested.

CLAIM AMENDMENTS

Minor amendments have been made to claims 1, 3, 6 and 7. These amendments are not related to the patentability of the claims, but are instead made to correct grammatical errors and to place the claims in better form for allowance.

PRIOR ART REJECTIONS

In the Office Action claims 1, 3, 5 and 6 are rejected under 35 USC 102(b) as being anticipated by USP 5,523,573 (Hanninen et al.). Claims 1, 3 and 5-7 are rejected under 35 USC 102(b) as being anticipated by USP 6,238,874 (Jarnagin et al.). Claim 3 is rejected under 35 USC 103(a) as being unpatentable over Hanninen

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et al. Claims 2 and 4 are rejected under 35 USC 103(a) as being unpatentable over Hanninen et al. in view of USP 5,793,049 (Ballard).

In response, claims 2 and 4 are cancelled and limitations from claims 2 and 4 are incorporated into claim 1.

The present claimed invention as defined by independent claim 1 is directed to a fluorescence reader which detects fluorescence from a sample present on a carrier or in a solution. The fluorescence reader includes a light source which radiates parallel light, a projection lens which converges the light from the light source, an excitation pinhole disposed at a front-side focal position of the projection lens, which shapes the parallel light radiated from the light source, and an objective lens which permits the light converged at a rear-side focal position and radiated onto the sample to pass through the objective lens. The fluorescence reader also includes an image forming lens which forms fluorescence emitted from the sample and passed through the objective lens into an image, a light receiving pinhole disposed at an image forming position of the image forming lens, and a detector which detects the fluorescence passed through the light receiving pinhole. A shape of the excitation pinhole and a diameter of the light receiving pinhole are capable of being changed.

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The present claimed invention as defined by amended claim 1 includes the feature that the shape of an excitation pinhole provided at a front-side focal position of a projection lens and the diameter of a light receiving pinhole can be changed.

In the optical system of the present claimed invention, the shape of the excitation pinhole is variable. As a result, the area of a spot formed by a parallel luminous flux on the surface of a sample can be freely changed. Therefore, since diffracted light generated in the excitation pinholes forms a secondary pinhole image on the surface of the sample, focusing can be easily carried out. Also, the resolution of measurement can be freely changed since the area of the cross section of the parallel luminous flux can be freely changed.

When the diameter of the light receiving pinhole is set to be larger than a tertiary pinhole image, the total amount of fluorescence from the sample can be easily detected by the detector. On the other hand, when the diameter of the light receiving pinhole is set to be smaller than the tertiary pinhole image, fluorescence only from part of the sample can be measured. Thus, when the fluorescence is measured during successive scanning, an image of a fluorescence distribution of the sample can be formed, and the fluorescence distribution is then analyzed.

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As mentioned above, according to the present claimed invention, the shape of the excitation pinhole and the diameter of the light receiving pinhole are changed in accordance with the state of the sample or measurement purpose. As a result, the excitation pinhole and the light receiving pinhole can be more properly used. For example, when the object to be measured is a DNA chip or a DNA micro array which has distortion and deflection, etc., the amount of light per unit area of parallel light passing through the excitation pinhole becomes constant. Thus, measurement can be uniformly performed without being influenced by the flatness of the object. In addition, when the diameter of the light receiving pinhole is increased, the total amount of fluorescence from the object can be detected at once. Hence, it is not necessary to finely scan the object, and scanning can thus be simplified. Furthermore, if a number of samples are provided as the objects to be measured, the diameter of the light receiving pinhole is decreased so that one sample can be excited with a very small amount of light. Thus, when the samples are successively excited such that each sample is excited by a very small amount of light, scanning can be carried out with high speed.

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As indicated above, claim 1 is amended to include limitations from claims 2 and 4. In rejecting claims 2 and 4, the Examiner relies upon USP 5,793,049 (Ballard).

FIG. 5 of Ballard teaches a shutter 128 and a shutter 154, there merely to selectively permit light to pass through them. To be more specific, unlike the excitation pinhole of the present claimed invention, the shutter 128 of Ballard is not a pinhole, nor does it shape parallel light radiated from the light source. The shutter 154 also is not a pinhole. That is, the shutters 128 and 154 are not pinholes which are variable in shape or diameter as the excitation pinhole, as recited in amended claim 1.

As is clear from the above, Ballard does not disclose a structure in which the shape of an excitation pinhole located in a front-side focal position of a projection lens and the diameter of a light receiving pinhole located in an image forming position of an image forming lens can be changed as in the present claimed invention.

None of the other references of record close the gap between the present claimed invention as defined by amended claim 1 and Hanninen et al. when taken either alone or in combination with Ballard.

In view of the foregoing, claim 1 is patentable over the cited references under 35 USC 102 as well as 35 USC 103.

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Claims 3 and 5-7 are either directly or indirectly dependent on claim 1 and are patentable over the cited references in view of their dependence on claim 1 and because the references do not disclose, teach or suggest each of the limitations set forth in claims 3 and 5-7.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner disagrees with any of the foregoing, the Examiner is respectfully requested to point out where there is support for a contrary view.

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If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,


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Encl.: Petition For Extension of Time